

Education Module

Title:

Understanding the effects of water pollution on an aquatic habitat.

Author:

Fei-Ting Chang

Grade Level/Subject:

Grade 7/ Science (water pollution)

Curriculum Standard:

NSES:

Science in Personal and Social Perspectives

CONTENT STANDARD F:

As a result of activities in grades 5-8, all students should develop understanding of

- * Populations, resources, and environments
- * Natural hazards

AAAS Benchmarks. Project 2061:

By the end of the 8th grade, students should know that

- In all environments—freshwater, marine, forest, desert, grassland, mountain, and others—organisms with similar needs may compete with one another for resources, including food, space, water, air, and shelter. In any particular environment, the growth and survival of organisms depend on the physical conditions.
- What people expect to observe often affects what they actually do observe. Strong beliefs about what should happen in particular circumstances can prevent them from detecting other results. Scientists know about this danger to objectivity and take steps to try and avoid it when designing investigations and examining data. One safeguard is to have different investigators conduct independent studies of the same questions.

Overview:

This experiment is a two week long experiment that requires daily observation. Students will conduct an experiment on the effect of pollution in water. The students will examine the effects of detergents and fertilizers on aquatic life. Through the experiment, students will use scientific methods and reasoning in conducting the experiment.

Students will discuss solutions with their group for answers for solving water pollution problems.

Purpose:

- To educate students on water pollution.
- To encourage student participation in group work.
- To enhance critical thinking through group discussion.

Learning Objectives:

- Students will understand the effect of nitrogen and phosphate in water pollution.
- Students will draw conclusions from their observation in the experiment.
- Students will use critical thinking to discuss the issues that lead to and solutions of water pollution.

Vocabulary:

Dissolved oxygen
Eutrophication
Cultural eutrophication
Phosphate
Nitrate/Nitrogen
Hypothesis
Control

Resources/Materials:

Data sheet (dissolved oxygen / physical observation)

Detergent containing phosphate
Fertilizer in powder form
Water & Water plants & mud from pond
Plastic Jars
Test tubes
Measuring spoons
Methylene blue indicator

Preparatory Activities:

(Day 1)

Prior Knowledge Assessment: (10minutes)

- Students will have prior lessons on eutrophication and cultural eutrophication. Students will brainstorm within their group on ideas of how water is used daily

Lesson: (40 minutes)

- As a class, students will discuss the usage of water.

- Students will be taught on the make-up of water.
- Students will be taught about water use and abuse in agricultural and everyday setting.
- Students will be taught about chemical (Phosphate & Nitrate) in fertilizer and detergent.
- Students will be taught about the importance of oxygen to aquatic organisms.
- Students will be taught about the threat of water pollution to marine life.

Main Activities:

(Day 2)

Experiment: effects of water pollution (40minutes).

As a class students will discuss what they have learned about pollution. Today, students will conduct an experiment that shows the effect of pollution (detergent and fertilizer) in water. Before the experiment is carried out, students will learn about the usage of methylene blue indicator solution to test for dissolved oxygen.

-Two jars containing water, mud, and water plants from pond will be used as the control for the classroom.

STEPS OF EXPERIMENT:

-Students will work in groups of five. Each group will have eight jars. The jars will contain “equal” amount of pond water, water plants and mud. Four of the eight jars will be labeled with jar number and “detergent”. The remaining four jars will be labeled with number and “fertilizer”.

-Students will first test for dissolved oxygen in each of the eight jars after mud, water plants and water is placed in it.

PROCEDURE FOR TESTING DISSOLVED OXYGEN: (Allow 1 hr to check for dissolved oxygen)

-Extract 2 milliliters of water from jar, add 1/2 milliliter of methylene blue indicator solution to the water.

-Record amount of time it takes to change from dark blue to very light blue or clear.

-Students will add detergents and fertilizers into the jars.

JARS (Detergent)

- 1 1/4 tsp. detergent
- 2 3/8 tsp. detergent
- 3 1/2 tsp. detergent
- 4 1 tsp. detergent

JARS (Fertilizer)

- 1 1/4 tsp. fertilizer
- 2 3/8 tsp. fertilizer
- 3 1/2 tsp. fertilizer
- 4 1 tsp. fertilizer

(Day 3-10)

DATA COLLECTION:

-Every day the students will record the physical environment of the jar on their data sheet.

-Dissolved oxygen will be tested every other day until the end of the experiment.

(Day 10)

-Analyze data as a group, apply it toward aquatic habitat.

Follow up activity:

(Day 11)

-Students will be presented a problem with drinking water in their community. Students in their groups of five will come up with a solution (guidelines) to solve the water safety problem in their community.

Data Sheet for observation:

(Additional data sheet will be provided for the students)

F=Fertilizer D=Detergent

JAR #	Date	OBSERVATION
1-F		
2-F		
3-F		
4-F		
1-D		
2-D		
3-D		
4-D		

Data Sheet for Dissolved Oxygen test:

JAR #	Date	Dissolved oxygen Time
1-F		
2-F		
3-F		
4-F		
1-D		
2-D		
3-D		
4-D		